

Improving Energy Efficiency at the Watervliet Arsenal

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Background

- Watervliet Arsenal
 - Nation's oldest continually operating cannon production facility
 - 120-acre facility containing manufacturing, laboratory, and administrative buildings
 - More than 1,000,000 sq. ft. of manufacturing space
 - Energy-using systems
 - Cannon production equipment
 - HVAC: Steam and air handling equipment
 - Lighting
 - Compressed Air
 - Primary energy use: electricity, natural gas, fuel oil

Project Goals and Challenges

- Goals
 - Optimize energy use while preserving capacity to meet mission requirements and needs of private tenants
- Challenges
 - Facility systems designed for year-round 24/7 operations
 - Integrating needs of operations, public works, and IH directorates
- Drivers
 - Executive Order
 - Production Efficiency
 - Cost

Approach

- Cost offset: Facilitated award of grant for 50% of project cost from New York State Energy Research and Development Authority (NYSERDA)
- Phased approach
 - Implementation of priority energy-savings projects while completing assessments at remainder of facility
 - Full audit of energy using systems
 - Monitoring: Lighting, HVAC, compressed air
 - Energy baseline model
 - Phase I: Manufacturing buildings
 - 5 buildings: 100,000 to 360,000 sq. ft.
 - Phase II: Laboratory, office, operations buildings
 - 9 buildings: 30,000 to 180,000 sq. ft.

Audit and Inventory

- How the space is used
- Where energy is used
 - Lighting
 - Heating
 - Ventilation
 - Controls
 - Compressed Air
 - Air Quality Requirements
 - Equipment Heat Loads
- How the building systems are controlled
- The space requirements, including indoor air quality



Specific Systems Evaluation

- Lighting Efficiency and Optimization
 - Current lighting has high Energy Intensity (EI)
 - New systems can provide better lighting and reduce EI
- Heating and Ventilation Optimization
 - Current control systems
 - Occupied vs. unoccupied control sequences
 - Air Requirements
- Compressed Air System efficiency and optimization
 - Overall system production and efficiency
 - Operation and control sequences
- Cost benefit analysis

Lighting

- Space Issues:
 - Total square footage is large at ~1,000,000
 - Maintaining lighting levels from ceilings heights of (30-90 feet)
- Lighting savings from efficiency and controls:
 - Utilize existing high bay fluorescent technology
 - Provide better operational controls
 - Total annual savings for manufacturing spaces will be approximately 1.3 Million kWh if implemented, with a cost savings of \$115,000

Lighting

- What can a good paint job do for you?



- Do you think the lighting was changed?

Heating and Ventilation

- Space Issues:
 - Total volume of space is large at ~30,000,000 cubic feet
 - Proper ventilation rates based on process and IH
- Heating and Ventilation savings from efficiency upgrades:
 - Utilize Controls for occupied and unoccupied periods
 - Separate Heating and Ventilation
 - Utilize Controls for matching air requirements
 - Total annual savings for manufacturing spaces will be approximately 750,000 kWh and 21,000 MMBtu if implemented, with a cost savings of \$377,000

Compressed Air

- Issues:
 - Distance between compressed air uses extremely large
 - System redundancy necessity (1000 HP connected)
- Monitoring of Entire Compressed Air System:
 - Monitored all compressors within the system for 2 months to show operational sequencing
 - On/Off cycling of compressors
 - Operation of Compressors with VFDs not optimal
 - Total energy usage of the electrical compressed air system

Compressed Air

- Compressed Air savings from system optimization:
 - Remove full system redundancy, but have compressor redundancy
 - Run Compressors at their optimal efficiency levels
 - Shutdown unnecessary compressed air generation during unoccupied periods
 - Run compressors closer to end use at higher levels
 - Operate the compressors with VFD in a load following mode
 - Total annual savings for manufacturing spaces will be approximately 600,000 kWh and 2,600 MMBtu if implemented, with a cost savings of \$84,000

Total Energy Savings

- Electrical Savings:
 - Lighting: 1,300,000 kWh
 - Heating and Ventilation: 750,000 kWh
 - Compressed Air: 600,000 kWh
- Fossil Fuel:
 - Heating and Ventilation: 21,000 MMBtu
 - Compressed Air: 2,600 MMBtu
- Total Approximate Electrical Savings: 2,650,000 kWh
- Total Approximate Fossil Fuel Savings: 23,600 MMBtu
- Total Approximate Annual Cost Savings: \$576,000

Energy Efficiency Funding

- State Energy Program Funding:
 - Feasibility Funding \$140,000
 - Lighting Rebate (Scheduled Re-Lamp): \$30,000
 - Potential Rebate from Feasible Projects:\$318,000
- State Energy Programs Available:
 - www.dsireusa.org

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